



## **Determination of serum Amylase**

**Amylase** is an enzyme belonging to the class of hydro lases . It catalyzed the break down of starch and glycogen. Starch consists of both amylose and amylopectin . Amylose is along of glucose molecules linking by  $\alpha$  (1 - 4) glycosidic bonds and amylopectin is linked by  $\alpha$  (1 - 6) linkages at the branch points .

Amylase is an enzyme, or special protein, produced by your pancreas and salivary glands. The pancreas can sometimes become damaged or inflamed, which causes it to produce too much or too little amylase. An abnormal amount of amylase in your body may be a sign of a pancreatic disorder.

### **Amylase sources in the body :-**

1. Pancreas and the Salivary glands are the major tissue sources of serum amylase .
2. Skeletal muscle , small intestine and the fallopian tubes lesser concentrations .

Amylase levels can also rise due to other pancreatic disorders, such as:

- a. Pancreatic pseudocyst
- b. Pancreatic abscess
- c. Pancreatic cancer

Symptoms vary for the different diseases, but they may include:

- a. Upper abdominal pain
- b. Loss of appetite
- c. Fever
- d. Nausea and vomiting



## **Amylase properties**

1. It active in pH = 6.7 – 7 .
2. It is peaceful at room temperature with one week .
3. It is active at 37 °C .
4. Activity increase with  $\text{Ca}^{2+}$  and some anions such as  $\text{Cl}^-$  ,  $\text{Br}^-$  ,  $\text{NO}_3^-$  ,  $\text{ClO}_3^-$  ,  $\text{HPO}_4^{=}$  .
5. It is smaller size , the molecular weight of ( 50 – 55 ) K.D therefore it is appear in the urine .

Amylase is the serum enzyme most commonly relied up on for detecting pancreatic disease and it is useful in the diagnosis of acute pancreatitis in which significant increases in serum concentrations occure about 75 % of patients .

## **Types of amylase:**

### **1- $\alpha$ -amylase**

$\alpha$ -amylases names 1,4- $\alpha$ -D-glucan glucanohydrolase; glycogenase; saccharogen amylase, it is breaks down long-chain carbohydrates ultimately yielding maltotriose and maltose from amylose, or maltose, glucose and "limit dextrin" from amylopectin.

### **2- $\beta$ -Amylase**

It names 1,4- $\alpha$ -D-glucan maltohydrolase; glycogenase;.  $\beta$ -amylase catalyzes the hydrolysis of the second  $\alpha$ -1,4 glycosidic bond, cleaving off two glucose units (maltose) at a time.



### **3- $\gamma$ -Amylase**

It names: Glucan 1,4- $\alpha$ -glucosidase; amyloglucosidase; Exo-1,4- $\alpha$ -glucosidase; glucoamylase; lysosomal  $\alpha$ -glucosidase; 1,4- $\alpha$ -D-glucan glucohydrolase). Unlike the other forms of amylase,  $\gamma$ -amylase is most efficient in acidic environments and has an optimum pH of 3.

### **Clinical Significance :-**

#### **High amylase**

Amylase levels are increased in serum in many conditions

1. Pancreatic carcinoma .
2. Intestinal infuction .
3. Intestinal obstruction .
4. Pancreatic trauma .
5. Hepatitis .
6. Liver cirrhosis .
7. Cholecystitis .
8. Tubal, or ectopic pregnancy
9. Salivary gland lesions .

#### **Low amylase**

A low amylase count can indicate the following problems:

1. Preeclampsia
2. Kidney disease



## Dentistry Department

Title of the lecture: Estimation of serum amylase

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### Normal value :-

In a healthy individual, a normal blood amylase level is around 23-85 units per liter (U/L), although some lab ranges for normal amylase go up to 140 U/L.

### Principle :-

All methods depend on bonding of serum with substrate for this enzyme (starch) . starch hydrolysis by amylase to produce smaller molecules .

